NORTHWEST INDIANA COMPREHENSIVE HEALTH
PLANNING COUNCIL, INC.-- ENVIRONMENTAL
IMPACT - BEACH EROSION, INDIANA DUNES
NATIONAL LAKESHORE, Contract No.
CX-4000-4-0002, Preliminary Assessment
April 24, 1974

I - Revetment
II - Breakwater
III - Do nothing (allow erosion to continue)
IV - Protective Beach (beach fill)
V - Zoning
VI - groin system + beach fill
VII - Perched Beach
VIII - Perched Beach w/ groins

NORTHWEST INDIANA COMPREHENSIVE HEALTH PLANNING COUNCIL, INC.

ENVIRONMENTAL IMPACT - BEACH EROSION
INDIANA DUNES NATIONAL LAKESHORE

Contract No. CX-4000-4-0002

PRELIMINARY ASSESSMENT

24 April 1974

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INTRODUCTION

This letter-report sets out our impact analysis of the eight engineering alternatives for control of shoreline erosion along Reach One of the Indiana Dunes National Lakeshore. The report is divided into five parts: (1) Brief Statement of the Problem; (2) Methodology and Scope; (3) Analysis of Impacts Under Each Alternative (in narrative form); (4) Major Impacts Compared; and (5) Conclusions.

PART ONE

BRIEF STATEMENT OF THE PROBLEM

The shoreline of Lake Michigan beginning at the Michigan City Harbor and continuing westward to the boundary of the Indiana Dunes State Park, known as Reach One, has been subject to significant erosion of the dune toe coupled with a resultant sloughing of the dune face in recent years, and for that matter, during all periods when the water level of Lake Michigan is high. Also, sand in major quantities continues to move westward in the near shore zone due to littoral drift processes. In high water periods this then, coupled with the Michigan City harbor structures has contributed substantially to the erosion processes. Not only has the width of the beach narrowed, but also private residences within Reach One near the shore have been endangered or destroyed by the erosion processes. Moreover, the existing and potential uses of the shoreline area for education, recreation and preservation, goals of the Indiana Dunes National Lakeshore, are limited by past erosion and negated by prospects of future erosion.

Thus, the control of the shoreline by man's further intervention in some manner into the natural processes of wave action and littoral drift is considered desirable. Consequently, the National Park Service of the Department of the Interior, in conjunction with the U.S. Army Corps of Engineers (Chicago Region) has sponsored the development of various engineering alternatives designed to control the erosion processes, and stabilize the shoreline area within Reach One.

Our evaluation team, composed of an environmental engineer, an ecologist-biologist, a physical geographer, a geologist, a public administration evaluator-lawyer, and an environmental health expert, all residing near the area of study, was assembled to identify and assess the impacts of the various control mechanisms on the physical and social environments. The team has met frequently, first, to decide on a methodology for the impact assessment, and more recently, to study and assess the eight alternatives transmitted to us. Before we begin our specific assessment, however, we will discuss our methodology and scope of evaluation.

PART TWO

METHODOLOGY AND SCOPE OF ASSESSMENT

Initially, the members of our evaluation team developed "check lists" of possible impacts. We desired our lists to be expansive so as not to overlook areas or items of possible significance. The checklists were designed to identify the environmental, social and economic conditions that might be affected by the implementation of a particular alternative. We were aware that "impacts" are often "stepped," that is,

that "conditions" produce other conditions which in turn produce responses. Our checklists often triggered our thinking so as to recognize these stepped "cause-condition-effect" sequences. Moreover, the checklists forced us to consider all potentially significant impacts before focusing in on what to us were the most significant ramifications of an alternative.

After several meetings, we agreed upon two impact-identification-checklists: (1) an Environmental Conditions checklist (attachment 1 to this report; and (2) a Social, Economic, Political and Human Variables checklist (Attachment 2 to this report).

Upon beginning our assessment, however,we found the checklists overlapped in many instances and contained many areas where we all agreed no significant impacts could possibly ensue (for example, air quality). A new simplified checklist was developed (attachment 3 to this report) which set out 16 areas of major potential impact. Under each major area, where appropriate, subfactors were identified and listed. The 16 major areas were: (1) Impacts During Construction; (2) Surface Water Quality; (3) Shoreline Erosion; (4) Sediment Transfer; (5) Biotic Communities; (6) Aesthetics; (7) Historical Preservation; (8) Patterns of Land Use; (9) Population; (10) Residential Structures; (11) Governmental Jurisdiction; (12) Impact on ad valorem Tax Base; (13) Governmental Services; (14) Employment; (15) Recreational Patterns; and (16) Transportation.

Not only did the checklists enable us to identify areas of impact, but they also were constructed so as to allow us to express generally the magnitude or intensity of the impact on a scale of minus two to plus two. (See attachment 3)

Each evaluation team member completed a final checklist form for each of the alternatives and wrote a narrative explanation on all items checked plus or minus two - in other words, an explanation in narrative form of the significant impacts. We all kept in mind through this process that impacts are often linked.

Although recognizing linkages, one problem we all encountered was delineating parameters on the scope and direction of resultant impacts. We decided that we would have to identify and discuss (when warranted) not only primary but secondary (linkages) impacts. For example, protection of a perched beach area by a revetment could result in new housing construction within Beverly Shore's "Island", thus increasing the ad valorem tax base, thus increasing governmental services - both demand for and fiscal ability to furnish.

Another "scope" consideration we encountered concerned the geographic dimensions of impact, both inward from the beach, and along the beach east and west outside of Reach One. The latter dimension presented the more serious consideration since we agreed that significant impacts outside of Reach One would result under many of the alternatives - especially along the Indiana Dunes State Park shoreline and further west due to transfer of erosion processes westward. Also, we recognized that the Michigan City Harbor also would (under particular alternatives) be affected.

Thus, we identified significant probable impacts on a spatial scale beyond Reach One, from about the Bethlehem Steel bulkhead (landfill eastern margin) to the beach east of the Michigan City Harbor.

As to the Lakeward-Duneward dimension, we recognized that the intensity of impacts would be concentrated in three principal areas: (1) near-shore waters; (2) the beach; and (3) the foredunes and first high dune ridge back from the beach. This is not to say that both primary and secondary impacts don't extend beyond these areas, but only points out the areas of "concentrated impact."

One final "scope" problem must be noted - the time spectrum. We did not limit our impact analysis to current, existant environmental and social patterns, for we all agreed that the realization of the area for educational, recreational and preservation purposes as envisioned and planned for the Indiana Dunes National Lakeshore will largely depend on the mechanism ultimately adopted for shoreline erosion. Thus, our impact analysis extends to reasonably foreseeable as well as current environmental and social patterns.

Detailed assessment of significant impacts, both environmental and social which are probable under each of the eight alternatives follow and include Alternative Three, the "null" or "Natural Erosion" Alternative. Following this detailed assessment, we highlight significant impact areas in comparative fashion. We conclude this report by ranking the alternatives, setting out our policy basis for the ranking.

Revetment

PART THREE

ANALYSIS OF IMPACTS OF EACH ALTERNATIVE

Alternative I

This alternative and its options are designed to provide total protection for the sand dunes within Reach One at the expense of transferring the erosion related to littoral drift to the area downdrift of the revetment i.e., the Indiana Dunes State Park. Erosion here would cut into some of the dune areas heretofore least disturbed and some of the best developed foredunes, pine dunes, black oak dunes and blowout complexes. This in turn would negatively affect those associated biotic communities. Among the areas most likely to be subjected to increased erosion would be the Nature Preserve at the east end of the State Park, an area considered so valuable as a natural area that access to it is restricted. The significant differences among the options vary as to cost, amount of perched beach created, loss of wet beach and whether or not some nine existing structures shoreward of the revetment are protected.

The several options of this alternative would assure land holders along Reach One that some 113 existing structures would be protected over a 50 year period and that new structures could be built with safety. In all liklihood this would increase the market value of any undeveloped land. Should the National Park Service at some future date wish to acquire these properties, it could expect to pay a higher price. Structures most likely to be built would be (like those already there) high quality homes suitable for year round residence and owner occupied. Such building would of course, be largely south of Lakeshore Drive and

within the town of Beverly Shores east to Manor Avenue. Such improvements have the potential of materially increasing the tax base of Beverly Shores as well as requiring additional governmental services.

The construction of the revetment itself, however arranged, has several negative implications both short and long term. During construction truck routing and road damage problems would be considerable. No estimate is presently available to ascertain the number, weight and frequency of such trips. This is, of course, a temporary inconvenience without any long term implications. Another short term effect would be the increased turbidity in the immediate shallow water area created during construction which would settle out within a short time following completion of the revetment.

The most significant impacts are those long range implications of the revetment itself. Already mentioned has been the transfer of erosion down current to the State Park. While it is true that the perched beach areas have the potential for providing space for beach related recreational opportunities for some 2,700-3,400 people at any one time, the types and quality of the experience would certainly be limited. The armor stone boulders, extending shoreward, above the water line for 40+ feet certainly limit the recreational potential for hiking, sun bathing, swimming, etc. The requirement of ramps or stairways over the revetment to provide access to the wet beach and the water's edge at low lake levels seems an undue restriction to impose for a "public" National Lakeshore. An additional negative aspect is the opportunity lost for temporary small boat storage without the assistance of movable skids. Some increase in hull damages to small boats may be expected.

The revetment also poses a potential safety hazard. Some people, especially children, may be expected to attempt to run and play on the revetment. Given the irregularities of the boulders, and the potential for falls, there exists the possibility of fractures, sprains, abrasions, etc.

Finally, it is the evaluation teams'opinion that the revetment does not have a "natural" appearance. Indeed, this series of alternatives contain the least aesthetically pleasing type of revetment imaginable. Although visibility of the lake and shore itself is not impaired, the aesthetics of the revetment does represent a man made intrusion on the landscape.

Given the above discussion, the question is posed as to the objectives sought by this alternative. Are they the protection and potential enhancement of private property? Or is it to improve the recreational potential of the beach area?

Question: Will the revetment become buried by aeolian and other processes over some period of time? If so, after how long?

Redesign Suggestions: If this alternative is pursued further, some consideration must be given to protecting the State Park from any adverse effects of the Reach One revetment. A more aesthetically pleasing type of revetment can be considered.

Breakwate

Alternative II

This alternative through a series of five disconnected segments of offshore breakwater is designed to stabilize the existing shoreline within Reach One. In so doing, increased rates of erosion can be expected downdrift from the breakwater termination, i.e., the Indiana Dunes State Park. The effect would be the same as that of Alternative I already discussed. Additionally some shoaling may develop at the southwest end of the breakwater which may have to be dredged periodically.

The effect on residential land use within Reach One approximates that of option B of Alternative I. However, Alternative II has a decidedly different impact upon potential recreation opportunities, specifically those that are water related. The basin in the lee of the structure will considerably enhance water-skiing, fishing and other small boat activities and could increase the safety of near shore swimming. Additionally, no obstruction limits beach access or interferes with shore related recreation such as sun bathing, hiking, etc.

However, this alternative does not provide for sand replenishment or replacement of the eroded beach. Thus the amount of space available for beach activities is limited to that existing at the time of construction.

The breakwater has several negative implications in addition to its impact on downdrift erosion. The exposed breakwater restricts the lake view and certainly is less aesthetically pleasing than an open shoreline. It may interfere with potential beach and subsequent dune building processes in that little sand nourishment will occur unless the Michigan

City harbor structure is altered.

The breakwater does pose some safety problems. In encouraging small boat activities in the lee basin, there is increased potential for boat-to-boat, boat-to-swimmer and boat-to-breakwater accidents. Moreover, it would be difficult to limit boaters access to the breakwater. These safety problems increase the surveillance required to be provided by the National Park Service, Coast Guard and/or the Indiana Department of Natural Resources.

Construction will create some local turbidity which will settle out within a short distance from the construction site. During this time boating in the immediate area will be restricted. Some economic benefit will accrue to whatever harbor is used for rock transhipment.

Redesign Suggestions: If this alternative is implemented, it should consider the entire littoral cell downdrift to the Bethlehem Steel Breakwater. Also, some investigation should be made of tying this design into the Michigan City Plan for enlarging their marina.

Do nothing (natural beach erosion contin

Alternative III

During periods of high-water levels, shoreline erosion and bluff recession, can be expected to continue. Whether these natural processes will accelerate, decrease or remain nearly constant with recent past rates of bluff recession no one can accurately predict. Sediment transfer in the direction of the littoral drift would continue, removing great amounts of sand which would have accreted in the area of the Indiana Dunes National Lakeshore and Indiana State Park. Biotic communities would be affected as a result. Aesthetically, in periods of high-water level, there would be a small or non-existant beach, thus detracting from the benefits derived from a wide beach expanse.

Residences near the water's edge would be threatened and those north of Lakeshore Drive might be destroyed. Nature preserves, roads and the National Lakeshore beach all would be threatened and indeed could be destroyed through the natural erosion processes. Then too, population would go down as residences are abandoned, the smaller beach would mean fewer visitors, etc. The density and number of residential structures would decline, and consequently, the ad valorem tax base of Beverly Shores would decrease.

The National Lakeshore and State Park's beaches available for recreational uses would be limited and periodically nearly eliminated during high-water periods. Thus, beach related activities including sun bathing, swimming, hiking and picnicing would be discouraged. Since significantly fewer people would use the natural area, roads to the beach and the South Shore railroad would be affected. Property, in terms of existing residences, would not be protected. But neither would the beach, or the foredunes.

- Protect Beach

- artificia
dune

Alternative IV

This alternative is to prevent further dune/bluff recession along Reach One by the artificial placement of borrow material on the present beach in quantities sufficient to form a protective berm. Unlike the alternatives discussed so far, it will not only protect the immediate shore area but should have no negative (indeed, a positive) effect on downdrift erosion. The newly created beach would presumably be part of the National Lakeshore thus having significant recreation potential while providing protection to the toe of the foredunes. By providing this additional space having recreational potential, several secondary effects may occur. More bathers, hikers and other visitors may be attracted. This would encourage development in nearby areas of commercial activities related to beach visitation, i.e. restaurants, shops, sporting goods, etc. Residential use would continue and probably expand but more in the direction of summer and week-end use. More building directed toward accomodating large numbers of visitors seeking recreation opportunities would occur contiguous to if not in the town of Beverly Shores and the Lakeshore itself.

The tax base of Beverly Shores would expand accordingly. On the other hand Beverly Shores and the Lakeshore would need to provide considerable additional services, i.e., public water and sanitation facilities, garbage collection and disposal, police and fire protection, etc. This creates potential for interjurisdictional conflict.

With the potential influx of non-resident visitors, new employment opportunities will be created, especially during the summer months.

Beach and water related activities should be greatly enhanced by this alternative but care must be taken to protect the natural history and educational value of the area. Certain activities would need to be forbidden (dune buggying, motor cycling, etc.) and access to certain areas restricted.

This alternative and VII are the most aesthetically pleasing of all of the alternatives. In fact they would significantly enhance an area already visually degraded by erosion.

One additional positive impact will manifest itself in reduced maintenance dredging requirements for the Michigan City Harbor by the interception of the littoral drift at the borrow location. At the same time further accretion east of the Michigan City breakwater may diminish thus limiting that beach's size and shape possibly incurring a negative impact to that recreational area. Of course, during beach construction and dredging, boating and beach activities would necessarily be restricted.

Redesign Suggestion: If this alternative is pursued further, consideration should be given to zoning restrictions and other land use controls inland of Reach One to provide for orderly and environmentally acceptable growth throughout the area.

Zoning

Alternative V

This alternative provides no shoreline protection or enhancement but seeks to prevent further economic losses along the shore by preventing new construction in high-risk erosion areas and restricting construction within certain zones along Reach One.

The construction limitations proposed would likely result in a larger number of lower cost units than would otherwise be built and could shift the summer/permanent resident ratio in the direction of favoring summer occupance. This development would add more units for tax purposes. To what extent the assessed valuation would compensate for the additional governmental services is speculative.

This alternative proposes that development in the limited construction zone be restricted to mobile homes or other readily movable units. This seems to indicate that they may be moved at some future date if shore erosion should endanger them. The question arises as to where these would be moved?

Additionally, it is unclear as to whether or not it is assumed that 113 existing structures would be destroyed over a 50 year period as discussed in Alternative III.

This alternative is a form of "do nothing" choice which may fit a public policy concommittent with returning the area to its natural state as part of the future (circa 2000) National Lakeshore. It results, however, in further loss of the present foredunes and highdunes areas at continued high water stages and as long as the Michigan City harbor structure remains unmodified.

Groins + Beachfi

Alternative VI

This alternative is to prevent further loss of recreational beach and dune areas along Reach One by constructing a series of 27 steel sheet pile groins spaced 1,000 feet apart. Approximately 3,960,000 cubic yards of borrow material would be required to fill the areas between the groins thus maintaining a minimum artificial beach width of 50 feet between the groins.

In this way, Alternative VI does protect Reach One and does afford additional beach space available for recreational purposes. However, the quality of such beach related activities will be hindered to some extent, since the groins will protrude some feet above the sand along the foreshore slope from the beach berm down to the water. Furthermore, at any lake levels below +2 foot, the outboard ends will be exposed. This of course creates a considerable safety hazard not only to boaters and skiers but to swimmers as well. Marking the outer limits with navigation aids will help somewhat but the hazard potentials remain.

In protecting Reach One, this alternative can be expected to transfer the zone of severe erosion from the present problem area downdrift to the Indiana Dunes State Park. Erosion here would cut into some of the dune areas heretofore least disturbed and some of the best developed foredunes, pine dunes, black oak dunes and blowout complexes. This in turn would negatively affect those associated biotic communities. Among the areas most likely to be subjected to increased erosion would be the Nature Preserve at the east end of the State Park, an area considered so valuable as a natural area that access to it is restricted.

By protecting the shore within Reach One, Alternative VI would assure land holders that some 113 existing structures would be protected and that new structures could be built with safety. In all liklihood, this would increase the market value of such undeveloped land. Should the National Park Service wish to acquire these properties at some future date, it could then expect to pay a higher price. Structures most likely to be built would be (like those already there) high quality homes suitable for year round residence and owner occupied. Such building would, of course, be largely south of Lake Shore Drive and within the Town of Beverly Shores east to Manor Avenue. Such improvements have the potential of materially increasing the tax base of Beverly Shores as well as requiring additional governmental services.

During construction, beach related activities would be restricted within the immediate area. Considerable noise would be generated. Likewise boating would be restricted at the dredging site. The dredging and disposal will create increased turbidity in the immediate area. This would settle out within a short distance from the dredge area and the disposal site. These, of course, are short term inconveniences.

Aesthetically, this is less desirable than an open shoreline. The beach is in effect, compartmentalized by the protruding groins, the offshore ends of which may have navigation aids.

Finally the requirements for maintenance dredging of the Michigan City Harbor should be lessened as the borrow site is expected to intercept the littoral drift.

Redesign Suggestions: Consideration must be given to preventing any negative downdrift effects in the State Park. More aesthetically pleasing groins can be designed, possibly using 40 inch diameter, sand-filled longard tubes as exist at the Berrien Michigan pilot project site.

Perched Beach

Alternative VII

Alternative VII proposes to protect and to enhance the shoreline within Reach One by creating a protective beach from artificially placed borrow material. The perched beach so created utilizes a toe structure to retain the beach in a perched position. This alternative then is similar to Alternative IV with the exception of the toe.

Like Alternative IV no erosion impacts are transferred downdrift to the State Park. The new beach created would presumably be part of the Indiana National Lakeshore, thus having significant recreational potential, several secondary effects may occur. More bathers, hikers and other visitors may be attracted. This, in turn, would encourage development of commercial activities related to beach visitation, i.e. restaurants, shops, sporting goods, etc. Residential use would continue and probably expand but more in the direction of summer and week end use. More building directed toward accomodating large numbers of visitors seeking recreation opportunities would be contiguous to if not within the town of Beverly Shores and the Lakeshore itself.

The tax base of Beverly Shores would expand accordingly. On the other hand Beverly Shores and the Lakeshore would need to provide considerable additional services; public water and sanitation facilities, solid wastes collection and disposal, police and fire protection, etc. This creates potential for interjurisdictional conflict.

With the potential influx of non-resident visitors, new employment opportunities will be created especially during the summer months.

Beach and water related activities should be greatly enhanced by this alternative but care must be taken to protect the natural history and educational value of the area. Certain activities would need to be prohibited (dune buggying, motor cycling, etc.) and access to certain areas restricted.

This alternative and IV are the most aesthetically pleasing of all the alternatives. In fact, both significantly enhance an area already visually degraded by erosion.

One additional positive impact will manifest itself in reduced maintenance dredging requirements for the Michigan City Harbor by the interception of the littoral drift at the borrow location. At the same time further accretion east of the Michigan City breakwater may diminish, thus limiting that beach's size and shape possibly incurring a negative impact to that recreational area.

Of course, during beach construction and dredging, boating and beach activities would necessarily be restricted.

The significant differences in impacts between Alternatives IV and VII accrue as a result of the submerged sill and stone apron of Alternative VII.

At low lake levels, the crown of the sill will be -3.5 to -5 foot LWD thus posing a potential hazard to small craft, to water skiers and to swimmers. The potential for hull damage on the rocks is greater than that of the sand bars. The sudden drop-off created by the sill is a potential hazard to bathers. The sill location should be marked for safety purposes. There appears to be no significant differences in potential impacts between the stone sill option and the longard tube option.

Redesign Suggestion: If this alternative is pursued further, consideration should be given to zoning restrictions and other land use controls to provide for orderly and environmentally acceptable growth throughout the area.

Perched Beach w/groining

Alternative VIII

This alternative is to provide shore protection and beach enhancement through the perched beach concept of Alternative VII plus the addition of a low groin field of 16 flexible longard tubes 400-500 feet long spaced 1,000 feet apart.

The significant difference in impact is the potential for some erosion and scour immediately downdrift of the termination of the groin field in the Indiana Dunes State Park area, should an insufficient supply of sand not overtop the last groin. Monitoring and additional protection will be necessary should this occur.

The newly created beach would presumably be part of the National Lakeshore thus having significant recreation potential while providing protection to the toe of the foredunes. By providing this additional space having recreational potential, several secondary effects may occur. More bathers, hikers and other visitors may be attracted. This would encourage development in nearby areas of commercial activities related to beach visitation, i.e. restaurants, shops, sporting goods, etc. Residential use would continue and probably expand but more in the direction of summer and week-end use. More building directed toward accomodating large numbers of visitors seeking recreation opportunities would occur contiguous to if not the town of Beverly Shores and the Lakeshore itself.

The tax base of Beverly Shores would expand accordingly. On the other hand Beverly Shores and the lakeshore would need to provide considerable additional services, i.e., public water and sanitation facilities, garbage collection and disposal, police and fire protection, etc.

This creates potential for interjurisdictional conflict.

With the potential influx of non-resident visitors, new employment opportunities will be created, especially during the summer months.

Beach and water related activities should be greatly enhanced by this alternative but care must be taken to protect the natural history and educational value of the area. Certain activities would need to be forbidden (dune buggying, motor cycling, etc.) and access to certain areas restricted.

This alternative would have no significant negative impacts on aesthetics as the groins and sill are all unobservable. Indeed by creation of the beach, it should significantly enhance the area already visually degraded by erosion.

One additional positive impact will manifest itself in reduced maintenance dredging requirements for the Michigan City Harbor by the interception of the littoral drift at the borrow location. At the same time further accretaion east of the Michigan City breakwater may diminish thus limiting that beach's size and shape possibly incurring a negative impact to that recreational area. Of course, during beach construction and dredging, boating and beach activities would necessarily be restricted.

Redesign Suggestion: If this alternative is pursued further, consideration should be given to zoning restrictions and other land use controls in land of Reach One to provide for orderly and environmentally acceptable growth throughout the area.

PART FOUR

COMPARISON OF IMPACTS OF ALTERNATIVES

Alternatives III and V are similar in that neither proposes any shore protection but allows the erosion processes to continue. Thus, as bluff recession continues, some 113 existing structures will either be destroyed or removed over a 50 year period. Either because of safety and economic reasons, or governmental regulation new construction would be considerably limited. Such limitations could have a net positive benefit in helping to maintain the "naturalness" of the area by keeping building and population densities low but at the cost of considerable high water stage erosion of foredune and high dune areas. However if, as in Alternative V, mobile homes or movable structures are encouraged in the back dune area, this benefit may not be realized. Furthermore, this construction would increase the public services required to be provided by the town of Beverly Shores, the cost of which may not be offset by the incremental addition to the assessed valuation.

Additionally there would be considerable recreational opportunity loss in both alternatives. At high water stages, the beach would be non-existant or limited to a narrow strip unaccomodating to any significant number of people.

Alternatives IV, VII and VIII all have similar impacts on land use within Reach One. All provide the same degree of protection and safety of the beach and foredune areas. All would encourage recreational and residential developments. Thus the second and third order impacts on employment, biotic communities, residential occupance, aesthetics, historic and educational values may be assumed to be similar.

Alternatives IV and VII unlike VIII do not transfer erosion downdrift to the State Park area. Alternative VIII does have this potential if sand does not overtop the westward terminal groin. It is assumed, however, that provision of artificial replenishment at this point could negate any adverse impacts.

Other significant differences in impact arise from the sills proposed in VII and VIII. These sills pose potential safety hazards to boaters, water skiers and swimmers, especially at low water stages. Markings of some sort would be required. VII and VIII of course, require less frequent sand renourishment.

The evaluation team is of the opinion that these three alternatives (IV, VII and VIII) have the highest potential for not only preventing further destruction of the shoreline but of enhancement for a multitude of purposes. However, in order to recover these benefits with minimal adverse impacts, land use plans and controls must be carefully developed.

Alternatives I, II and VI all provide protection and varying improvement of the beach area within Reach One at the expense of transferring erosion downdrift to the State Park. The evaluation team considered this as an unacceptable trade-off.

For further comments see the discussion under the specific alternatives.

PART FIVE

CONCLUSIONS

After reviewing all of the engineering alternatives, we have concluded that to various degrees they promote two more or less incompatible basic interests. These interests are: (1) Enhancement of the "naturalness" of the area, thus assuring the area for Indiana Dunes National Lakeshore end uses - primarily recreation, education and preservation; and (2)

Protection of residential property values, thus protecting the investment of present and future residential property owners. This is not to suggest that the two goals are automatically mutually exclusive, but it does appear to us that to preserve private residences (indeed to construct an alternative which would encourage more private residential building) is to discourage Indiana Dunes National Lakeshore objectives (as exemplified by the lease-back program for long-term land and building acquisitions). Moreover, in the long run, assuming the National Lakeshore eventually expands to include "the Island", the ultimate cost to the taxpayers would be much greater than if the new construction never took place.

Finally, the members of the evaluating team do not come to this assessment process with "tabula rosas,"(blank minds). We do have value preferences and these include: (1) preservation to the extent possible of an environment in which natural lake-wind-beach-dune-biotic processes are possible; (2) preservation of unique biotic communities and geologic and topographic features; (3) realization of the recreational and educational opportunities which should result from development and enhancement of the National Lakeshore and adjacent Dunes State Park; and (4) attainment of a shoreline within Reach One (part of the National Lakeshore) which is aesthetically pleasing and which preserves this unique area for our children and their children.

Thus, it is with a basic agreement of this orientation towards value preferences that, given the specific impacts identified and discussed above, we rank our preferences beginning with what we conclude to be the most desirable and ending with what we conclude to be the least desirable alternatives.

It is emphasized however, that our value-preference orientation only affected our *ranking*, it did *not* affect our identification and description of impacts set out in Parts Three and Four of this report.

Our ranking follows:

IV		Most desirable
VII		
VIII		
VI		
II		
V		
III		
I	B	
	A	
	C	
	D	Least desirable

ATTACHMENT I

Checklist of Potential Impacts on Environmental Conditions

1. Surface water quality
Elements a. sensory - turbidity, sedimentation, etc.
b. health-related quality - potable supply and water sports
c. temperature - especially re outfalls, existing and/or new
d. nutrient content - addition via runoff, algal growth
e. mineral content
Areas a. near shore - inside offshore structures or sand nourishment zones
b. offshore - in zone of structures or nourishment
c. deep water offshore
d. inland - wetlands behind dunes

2. Surface water quantity
Elements a. potable water resource - municipal or private
b. flood or erosion potential - re changes in lake level, rise
c. accretion and deposition - re changes in lake level, drop
Areas a. near shore
b. offshore
c. deep water
d. inland

3. Subsurface water quality
Elements a. sensory
b. health-related quality - used as potable supply for residences
c. temperature
d. nutrient content
e. mineral content
Areas a. dunal area - residential
b. wetlands behind dunes
c. shore zone

4. Subsurface water quantity
a. availability for potable supply and otherwise in dunes
b. availability to maintain level of water table in wetlands

5. Air quality
not likely to be affected by this project
a. gaseous
b. particulate
c. climatic

6. Sensory stimuli
Elements a. noise
b. odors
c. irritants
d. visual
Areas a. offshore
b. deep water
c. near shore
d. beach
e. head of beach
f. foredune
g. dune crest
h. wetlands
i. residential areas
j. city park
k. state park
l. National Lakeshore

7. Space, land use, and facilities
    a. residential - Beverly Shores, Long Beach; IDNL; Mich. City, Pines, Porter, et
    b. industrial - NIPSCO; Bethlehem Steel, NIPSCO
    c. commercial - Red Lantern
    d. recreational - INDL, IDSP, Washington Park, MC boat basin
        remainder of beach, commercial and private
    e. open space - IDNL, IDSP, Nature Reserve
    f. cultural
    g. institutional

8. Soil
    a. agricultural properties
    b. mechanical properties
    Areas: beach, offshore, foredune, dunes, developed lands, wetlands

9. Mineral resources
    a. reclamation from process
    b. non-metallic mineral resources - specialty sands, fill sand and/or gravel

10. Energy - during construction only

11. Changes of access - to all categories under 7
    a. services - utilities, water, electric, gas, sewerage, septics
    b. transportation -
    c. communication

12. Biotic communities
    both the quality and the quantity of communities may be affected;
    if aquatic diminishes in amount terrestrial typically increases, vice versa,
    but the quality of that added may not be comparable to that lost

    Terrestrial communities
        a. open beach - drift fauna and annual plants
        b. foredune communities
        c. pine dunes
        d. black oak dunes
        e. mesophytic pockets
        f. blowouts and associated communities

    Aquatic communities
        a. deep water communities of Lake Michigan - offshore
        b. shallow water communities of Lake Michigan - near shore
        c. streams draining into Lake Michigan - whether
            natural or ditches   steady or intermittent
        d. wetlands behind dunes

    continuities and discontinuities to be considered as corridors or
    barriers to dispersal

13. Unique or rare things
    a. IDSP Nature Reserve
    b. IDNL - Tolleston-Nipissing-Algonquin raised beach remnants
        current or recent beach
        buried and exposed clay units with tree stumps, snails, etc. 3700 B.P.
        foredunes, blowouts, shingle beaches, etc.
        sand bars offshore
    plant-animal communities characteristic of the foredunes, pine dunes,
        black oak dunes, wetlands, streams, and Lake Michigan
    some of the plant and animal species at the limits of their range or
        restricted to these unusual conditions
    scenic views of and from dunes

ATTACHMENT II

Expanded Tentative Checklist of Social, Economic, Political and Human Variables which may be disrupted by Shoreline Erosion Protective Alternatives

I Population

1.1 Permanent Residents
1.2 Summer Residents
1.3 Weekend Residents
1.4 Non-resident visitors
1.5 Number of school-age children
1.6 Density of Population
1.7 Rates of emmigration and immigration
1.8 Potential Relocation of Population Segments within Reach One

II Residential Structures

2.1 Density of Residential Structures
2.2 Number North of Lakeshore Drive
2.3 Number South of Lakeshore Drive
2.4 Probabilities of new Construction
2.5 Potential for Removal of Structures
2.6 Profile of Existing Structures by types (e.g. townhouse, single-family, etc.)
2.7 Access to Residential Sturctures
2.8 Planned Developments
2.9 Appurtenances to Residential Structures, including -
    (i) Garages
    (ii) Porches
    (iii) Boat Houses, etc.
2.10 Easements to and from Structures
2.11 Vistas from Residential Structures

III Governmental Units

3.1 Jurisdiction over Area Affected

(i) Federal Government (Caveat - H.U.D.)
    (a) U.S. Coast Guard
    (b) U.S. Army Corps of Engineers
    (c) U.S. Department of the Interior
    (d) U.S. Environmental Protection Agency

(ii) State of Indiana
    (a) Department of Natural Resources
    (b) Environmental Management Board and State Board of Health
    (c) Department of Commerce - Division of Planning

- (iii) Local Governmental Units
  - (a) Town of Beverly Shores
  - (b) Town of Michigan City (City)
  - (c) LaPorte County (Commissioners)
  - (d) Porter County (Commissioners)
  - (e) Michigan City Sanitary District
  - (f) Porter County Health Department and County Sanitarian; LaPorte
  - (g) County Surveyors (LaPorte and Porter)
  - (h) Townships (2 or 3)
  - (i) School Districts (2)

- (iv) Regional Planning Authorities
  - (a) Lake-Porter County Regional Transportation and Planning Commission, Highland
  - (b) Michigan Council of Governments

- (v) Governmental Advisory Groups
  - (a) National Lakeshore Advisory Panel
  - (b) Indiana Port Commission (Jack P. Fitzgerald)

3.2 Impact on Taxing Base (Ad Valorem)

- (i) Beverly Shores, Michigan City
- (ii) Porter, LaPorte Counties
- (iii) Townships
- (iv) School Districts
- (v) State of Indiana

3.3 Impact on Governmental Services

- (i) Solid Waste Disposal and Collection
- (ii) Fresh Water Resources and Access
- (iii) Waste Water Management Services
- (iv) Air Quality Control and Pollution Abatement
- (v) Police Services
- (vi) Fire Protection Services
- (vii) Public Health and Safety Services
- (viii) Road Maintenance Services
- (ix) Zoning Procedures and Processes
- (x) Identification of Possible Service Jurisdictional Conflicts
- (xi) Drainage and Flood Control
- (xii) Medical Services
- (xiii) Street Lighting and Other Improvements

IV "Public" Utilities

4.1 Jurisdiction in Affected Area

- (i) Northern Indiana Public Service Company
- (ii) Indiana General Telephone Company
- (iii) Bell Telephone Company

4.2 Impact on Easements Held By Utilities
4.3 Impact on Availability of Services

- (i) Gas
- (ii) Electric
- (iii) Telephone, Telex, etc.

4.4 Impact on Quantity and Quality of Services

- (i) Gas
- (ii) Electric
- (iii) Telephone, Telex, etc.

4.5 Impact on Costs of Services

- (i) Gas
- (ii) Electric
- (iii) Telephone, Telex, ect.

V. Land Use Characteristics: Location and Value of Land Structures (Assessed and Market)

5.1 Residential
5.2 Commercial
5.3 Industrial
5.4 Governmental

- (i) National Park
- (ii) State Park
- (iii) City and/or County Parks
- (iv) Buildings (e.g., Police, Fire, etc.)

5.5 Public Roads and Streets

- (i) Interstate
- (ii) State and County
- (iii) City and Town

5.6 Agricultural
5.7 Marsh
5.8 Open Space
5.9 Forest
5.10 Wilderness
5.11 Mining
5.12 Bridges
5.13 Physical, Man-Made Barriers
5.14 Man-Made Corridors
5.15 South Shore Railroad
5.16 Other Railroad Right-of-Ways
5.17 Easements - Utility

(i) Gas
(ii) Electricity
(iii) Phone
(iv) Sewers
(v) Fresh Water

5.18 Monuments

VI. Impacts of Landuse

6.1 Limiting

(i) Quantitatively
(ii) Qualitatively

6.2 Expanding

(i) Quantitatively
(ii) Qualitatively

Use List in V., supra.

VII. Employment Patterns and Impact

7.1 Number Employed
7.2 Locations of Employment and Number
7.3 Employment Classification

(i) Skilled
(ii) Semi-skilled
(iii) Non-Skilled
(iv) Professional Service
(v) Educational
(vi) Governmental Service, etc.

7.4 Number Retired
7.5 Number on Welfare
7.6 Number Unemployed
7.7 Possibility of New Jobs

(i) Type
(ii) Duration
(iii) Location
(iv) Skill prerequisites

7.8 Possibility of Disruptions in Existing Employment Patterns

(i) Permanent (long-ranging)
(ii) Temporary (short-durational)

VIII. Recreation Patterns

8.1. Identified

- (i) Hiking
- (ii) Fishing
- (iii) Back Packing
- (iv) Tent Camping
- (v) Trailer Camping
- (vi) Picnicing
- (vii) Summer Residences
- (viii) Swimming
- (ix) Water Skiing
- (x) Sunbathing
- (xi) Sailing, Leisure
- (xii) Sailing, Racing
- (xiii) House Boating
- (xiv) Pleasure Cruising, Motor Boat
- (xv) Hunting
- (xvi) Trapping
- (xvii) Observing Sunsets
- (xviii) Observing Beach from Water
- (xix) Observing Shire, Water and Sky from Land
- (xx) Bird Watching
- (xxi) Other Fauna Observations
- (xxii) Flora Observations
- (xxiii) Sand Skiing
- (xxiv) Snow Skiing
- (xxv) Tobagganing (etc.)
- (xxvi) Dune Racing (buggies)
- (xxvii) Snow Mobiling
- (xxviii) Mini-Bike Racing
- (xxix) Other (e.g., Basketball, volleyball, etc.

8.2 Impact on Recreation Patterns

- (i) Limiting
  - (a) Access and/or Opportunity
  - (b) Quality
- (ii) Expanding
  - ((a) Access and/or Opportunity
  - (b) Quality

- (iii) No Identifiable Impact

IX. Shopping Patterns

- 9.1 Michigan City
- 9.2 Chesterton/Porter
- 9.3 Valparaiso
- 9.4 Portage

- 9.5 LaPorte
- 9.6 Gary
- 9.7 Chicago
- 9.8 Beverly Shores
- 9.9 New Buffalo

X. Transportation Characteristics

- 10.1 Automobile

    - (i) Roads
    - (ii) Parking
    - (iii) Use

- 10.2 Boats

    - (i) Marinas
    - (ii) Piers
    - (iii) Beach Docking

- 10.3 South Shore Railroad
- 10.4 Michigan City Bus and Cab Patterns
- 10.5 Airplanes, other

XI. Aesthetics and Historical Preservation

- 11.1 Scenic Views and Vistas (Natural Beauty)

    - (i) Toward the Lake
    - (ii) Toward the Shore

- 11.2 Wilderness Qualities
- 11.3 Wilderness Preservation
- 11.4 Open Space Preservation
- 11.5 Landscape Design
- 11.6 Unique Physical Features (Dune preservation, Blow-out Preservation)
- 11.7 Rare and/or Unique Species

    - (i) Flora
    - (ii) Fauna

- 11.8 Historical Site Preservation
- 11.9 Archaeological Sites
- 11.10 Monuments
- 11.11 Park Preservation
- 11.12 Public Attitudes and Concern
- 11.13 Noise Intrusions
- 11.14 Traffic
- 11.15 Man-made or placed unnatural intrustions, protrusions, etc.

XII. Cultural Patterns

12.1 Recreational Patterns
12.2 Employment Patterns
12.3 Religious Patterns
12.4 Educational Patterns

  (i) Educational value (benefits) of Project

XIII. Maps

13.1 Land Ownership and Use

  (i) Residential
    (a) Single family
    (b) Multi-family

  (ii) Commercial
  (iii) Industrial
  (iv) Park
    (a) Federal
    (b) State
    (c) Local Government

  (v) Transportation
  (vi) Governmental
  (vii) Private Industry
  (viii) Corporate
  (vix) Institutional

13.2 Easements
  (i) NIPSCO
  (ii) G T & E'
  (iii) Bell Long Lines
  (iv) City, County Fresh Water
  (v) Sewers

13.3 Transportation Facilities

  (i) Roads and Highways
  (ii) Street and Alleys
  (iii) Railroad right-of=ways
  (iv) Boat Marinas

Checklist of [illegible] environmental [illegible]

Protection [illegible]

A. During [illegible]					
1. safety					
2. [illegible] in immediate area					
3 [illegible] (sand and [illegible])					
B. Surface water quality (sensory: body contact)					
1. in zone of structures or nourishment					
2. inside structures or nourishment zones					
C. Shoreline erosion as lake level changes					
D. Sediment transfer					
1. East Michigan C[illegible]					
2. Beach [illegible]					
3. Ind[illegible]					
E. Biotic communities					
1. open beach (ar[illegible], [illegible])					
2 foredune [illegible]					
3. stabilized dunes					
4. blowouts and [illegible]					
5. shallow water [illegible] area of L. Mich.					
F. Aesthetics (scenic views and vistas)					
1. offshore					
2. near shore					
3. along beach					
4. foredune [illegible]					
5. [illegible]					
6. State [illegible]					
7. National [illegible]					
G. Historical preservation					
1. [illegible] natural history record					
2. Unique or [illegible]					
a. [illegible] Nature [illegible]					
b. [illegible]					
3. [illegible]					
H. [illegible]					
1 [illegible]					
2. [illegible]					
3. [illegible]					
4. [illegible]					
5. [illegible]					
6 [illegible]					
I. [illegible]					
1. [illegible]					
2. [illegible]					
3 [illegible]					
4 [illegible]					
5 [illegible]					

	-2	-1	0	+1	+2
J. Residential structures					
1. Density of residential structures					
2. Number N of Lakeshore Drive (existing)					
3. Number S of Lakeshore Drive					
4. Probability of new construction					
5. Removal of existing structures					
6. Planned developments					
7. Appurtenances (e.g. boat houses)					
K. Impact on governmental jurisdiction					
1. Federal government					
a. U.S. Coast Guard					
b. U.S. Army Corps of Engineers					
c. U.S. Dept. of Interior					
2. State of Indiana					
a. Dept. of Natural Resources					
b. Board of Health, Env. Mgmt. Board					
c. Dept. of Commerce (promoting MC Marina)					
3. Local governmetnal units					
a. Town of Beverly Shores					
b. LaPorte Co. commissioners					
c. Porter Co. commissioners					
d. County Sanitarians and Health Depts.					
4. Regional planning authorities					
5. National Lakeshore advisory panel					
L. Impact on taxing base (ad valorem)					
1. Beverly Shores, Michigan City					
2. Porter and LaPorte counties					
3. Townships					
4. School districts					
5. State of Indiana					
M. Impact on governmental services					
1. Solid waste collection and disposal					
2. Fresh water resources and access					
3. Waste water management services					
4. Civil services (police, fire, health, etc.)					
5. Zoning procedures and processes					
6. Drainage and flood control					
7. Possible jurisdictional conflicts					
N. Impact on employment patterns					
O. Recreational patterns					
1. Beach related activities					
2. Water related activities					
a. swimming					
b. boating (including boat docking)					
c. fishing					
3. dune related (e.g. hiking, picnicing)					
4. natural history, educational activities					
P. Transportation					
1. Automobile (access to residences)					
2. Boats (access to parks)					
3. South Shore railroad					